

X16700B_US seq list revised Natl 12May2005.ST25.txt
SEQUENCE LISTING

<110> Watkins, Jeffry Dean
Pancook, James David

<120> Butyrylcholinesterase Variants That Alter the Activity of
Chemotherapeutic Agents

<130> X16700

<140> PCT/US 03/038684
<141> 2003-12-04

<150> US 10/310,666
<151> 2002-12-04

<150> US 60/509,072
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<170> PatentIn version 3.3

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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
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35 40 45

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
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 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser

50

65

Me

va

11

AS

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G1

Tr

Th

Le

G1

AS

G1

Le

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Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	305	310	315	320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly	325	330	335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu	340	345	350	
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser	355	360	365	
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn	370	375	380	
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys	385	390	395	400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala	405	410	415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu	420	425	430	
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu	435	440	445	
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser	450	455	460	
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro	465	470	475	480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr	485	490	495	
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr	500	505	510	
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys	515	520	525	
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp	Lys	530	535	540	
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln	545	550	555	560

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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 9
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 9
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttgaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctcattc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaagggac agctttttta gtctatgggt ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500

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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
 tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 10
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (286)..(286)
 <223> L286H

<400> 10

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
130						135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	His	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
370						375					380				

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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 11
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 11
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tttggtggca cggtaacagc ctttcttgga attcctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180

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tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttcca	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaaact	360
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gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatagcag	cctttggtgg	aaatcctaaa	agtgtaactc	tctttggaga	aagtgcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
attctgcaaa	gtggttccgc	gaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctccttggtc	agtaaacttt	ggtccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtctatgggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttggtg	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagtcttca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 12
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
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 <222> (227)..(227)
 <223> F227A

<220>
 <221> VARIANT
 <222> (286)..(286)
 <223> L286W

<400> 12

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Ala Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Trp Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

x16700B_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 13
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 13
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
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X16700B_US seq list revised Natl 12May2005.ST25.txt

aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
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ccctatggga ctcctttgcc kgtaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 14
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> F227A

<220>
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 <222> (287)..(287)
 <223> Xaa = Pro

<400> 14

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

X16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg val Glu Arg val Ile val val Ser Met
130 135 140

Asn Tyr Arg val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Ala Asn Ala Pro Trp Ala val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe val val Pro Tyr Gly Thr Pro Leu Xaa val
275 280 285

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys

530 X16700B_US seq list revised Natl 12May2005.ST25.txt 540
535

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 15
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 15
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctctgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc gaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctcttttggg tgtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac atggttttta gtcattgggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320

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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 16
<211> 574
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
<221> VARIANT
<222> (227)..(227)
<223> F227A

<220>
<221> VARIANT
<222> (287)..(287)
<223> S287G

<220>
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<222> (328)..(328)
<223> A328W

<220>
<221> VARIANT
<222> (332)..(332)
<223> Y332M

<400> 16

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

x16700B_US seq list revised Natl 12May2005.ST25.txt

Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80

Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
				85					90					95	

Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		

Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			

Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				

Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160

Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	

Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		

Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			

Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				

Gly	Ser	Ala	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240

Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	

Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		

Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Gly	Val
		275					280					285			

Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				

Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Trp Phe Leu Val Met Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<210> 17
 <211> 711
 <212> DNA
 <213> Mus sp.

<220>
 <221> misc_feature
 <222> (1)..(711)
 <223> Mouse anti-EGFR antibody variable light chain

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 gtcagtttct cctgcagggc cagtcagagt attggcaca acatacactg gtatcagcaa 180
 agaacaaatg gttctccaag gcttctcata aagtatgctt ctgagtctat ctctgggatc 240
 ccttccaggt ttagtggcag tggatcaggg acagatttta ctcttagcat caacagtgtg 300
 gagtctgaag atattgcaga ttattactgt caacaaaata ataactggcc aaccacgttc 360
 ggtgctggga ccaagctgga gctgaaacga actgtggctg caccatctgt cttcatcttc 420
 ccgccatctg atgagcagtt gaaatctgga actgcctctg ttgtgtgcct gctgaataac 480
 ttctatccca gagaggccaa agtacagtgg aaggtggata acgccctcca atcgggtaac 540
 tcccaggaga gtgtcacaga gcaggacagc aaggacagca cctacagcct cagcagcacc 600
 ctgacgctga gcaaagcaga ctacgagaaa cacaaagtct acgcctgcga agtcacccat 660
 cagggcctga gctcgcccgt cacaaagagc ttcaacaggg gagagtgtta g 711

<210> 18
 <211> 236
 <212> PRT
 <213> Mus sp.

<220>
 <221> MISC_FEATURE
 <222> (1)..(236)
 <223> Mouse anti-EGFR antibody variable light chain

<400> 18
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 Leu Pro Gly Ala Lys Cys Asp Ile Leu Leu Thr Gln Ser Pro Val Ile
 20 25 30
 Leu Ser Val Ser Pro Gly Glu Arg Val Ser Phe Ser Cys Arg Ala Ser
 35 40 45

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Gln Ser Ile Gly Thr Asn Ile His Trp Tyr Gln Gln Arg Thr Asn Gly
50 55 60

Ser Pro Arg Leu Leu Ile Lys Tyr Ala Ser Glu Ser Ile Ser Gly Ile
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Ser
85 90 95

Ile Asn Ser Val Glu Ser Glu Asp Ile Ala Asp Tyr Tyr Cys Gln Gln
100 105 110

Asn Asn Asn Trp Pro Thr Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys
225 230 235

<210> 19
<211> 2349
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<220>
<221> misc_feature
<222> (1)..(2349)
<223> Mouse anti-EGFR antibody variable heavy chain and constant heavy
chain hinge region of L530

x16700B_US seq list revised Natl 12May2005.ST25.txt

<400> 19
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tgcacagtct ctggtttctc attaactaac tatggtgtac actgggttcg ccagtctcca 180
ggaaagggtc tggagtggct gggagtgata tggagtgggt gaaacacaga ctataatata 240
cctttcacat ccagactgag catcaacaag gacaattcca agagccaagt tttctttaaa 300
atgaacagtc tgcaatctaa tgacacagcc atatattact gtgccagagc cctcacctac 360
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accaagggcc catcggctct ccccttgga cctcctcca agagcacctc tgggggcaca 480
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tcaggcgccc tgaccagcgg cgtgcacacc ttcccggctg tcctacagtc ctcaggactc 600
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tgcaacgtga atcacaagcc cagcaacacc aagggtggaca agaaagcaga gcccaaattc 720
tgtgacaaaa ctcacacatg tccaccgtgt ccaaagcttg aagatgacat cataattgca 780
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tatgatggca agtttctggc tcgggttgaa agagttattg tagtgtcaat gaactatagg 1200
gtgggtgccc taggattctt agctttgcca ggaaatcctg aggctccagg gaacatgggt 1260
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gatccccaag aaattcttct gaatgaagca tttgttggtc cctatgggac tcctttgtca 1620
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gaacttggac aatttaaaaa aaccagatt ttggtgggtg ttaataaaga tgaagggaca 1740
gcttttttag tctatggtgc tcctggcttc agcaaagata acaatagtat cataactaga 1800
aaagaatttc aggaagggtt aaaaatattt tttccaggag tgagtgaagt tggaaaggaa 1860

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aagttctcag aatggggaaa taatgccttt ttctactatt ttgaacaccg atcctccaaa 2040
cttccgtggc cagaatggat gggagtgatg catggctatg aaattgaatt tgtctttggt 2100
ttacctctgg aaagaagaga taattacaca aaagccgagg aaattttgag tagatccata 2160
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acaagctggc ctgtcttcaa aagcactgaa caaaaatatc taaccttgaa tacagagtca 2280
acaagaataa tgacgaaact acgtgctcaa caatgtcgat tctggacatc attttttcca 2340
aaagtctga 2349
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<210> 20
<211> 782
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
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<220>
<221> MISC_FEATURE
<222> (1)..(782)
<223> Mouse anti-EGFR antibody variable heavy chain and constant heavy
chain hinge region of L530
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<400> 20
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1 5 10 15
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Val His Ser Gln Val Gln Leu Lys Gln Ser Gly Pro Gly Leu Val Gln
20 25 30
```

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Pro Ser Gln Ser Leu Ser Ile Thr Cys Thr Val Ser Gly Phe Ser Leu
35 40 45
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```
Thr Asn Tyr Gly Val His Trp Val Arg Gln Ser Pro Gly Lys Gly Leu
50 55 60
```

```
Glu Trp Leu Gly Val Ile Trp Ser Gly Gly Asn Thr Asp Tyr Asn Thr
65 70 75 80
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```
Pro Phe Thr Ser Arg Leu Ser Ile Asn Lys Asp Asn Ser Lys Ser Gln
85 90 95
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Val Phe Phe Lys Met Asn Ser Leu Gln Ser Asn Asp Thr Ala Ile Tyr
100 105 110
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x16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Cys Ala Arg Ala Leu Thr Tyr Tyr Asp Tyr Glu Phe Ala Tyr Trp
115 120 125

Gly Gln Gly Thr Leu Val Thr Val Ser Ala Ala Ser Thr Lys Gly Pro
130 135 140

Ser Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr
145 150 155 160

Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr
165 170 175

Val Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro
180 185 190

Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr
195 200 205

Val Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn
210 215 220

His Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Ala Glu Pro Lys Ser
225 230 235 240

Cys Asp Lys Thr His Thr Cys Pro Pro Cys Pro Lys Leu Glu Asp Asp
245 250 255

Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met Asn Leu Thr
260 265 270

Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro Tyr Ala Gln
275 280 285

Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser Leu Thr Lys
290 295 300

Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln
305 310 315 320

Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu Met Trp Asn
325 330 335

Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ile
340 345 350

Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp Ile Tyr Gly

x16700B_US seq list revised Natl 12May2005.ST25.txt
 355 360 365

Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr Asp Gly Lys
 370 375 380

Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met Asn Tyr Arg
 385 390 395 400

Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro Glu Ala Pro
 405 410 415

Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln Trp Val Gln
 420 425 430

Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val Thr Leu Phe
 435 440 445

Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu Leu Ser Pro
 450 455 460

Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser Gly Ser Phe
 465 470 475 480

Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg Asn Arg Thr
 485 490 495

Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn Glu Thr Glu
 500 505 510

Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile Leu Leu Asn
 515 520 525

Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val Asn Phe Gly
 530 535 540

Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp Ile Leu Leu
 545 550 555 560

Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly Val Asn Lys
 565 570 575

Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly Phe Ser Lys
 580 585 590

Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu Gly Leu Lys
 595 600 605

x16700B_US seq list revised Natl 12May2005.ST25.txt
 Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser Ile Leu Phe
 610 615 620

His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn Tyr Arg Glu
 625 630 635 640

Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys Pro Ala Leu
 645 650 655

Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala Phe Phe Tyr
 660 665 670

Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu Trp Met Gly
 675 680 685

Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu Pro Leu Glu
 690 695 700

Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser Arg Ser Ile
 705 710 715 720

Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro Asn Glu Thr
 725 730 735

Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr Glu Gln Lys
 740 745 750

Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr Lys Leu Arg
 755 760 765

Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys Val
 770 775 780

<210> 21
 <211> 1722
 <212> DNA
 <213> Homo sapiens

<220>
 <221> misc_feature
 <222> (1)..(1722)
 <223> Human butyrylcholinesterase

<400> 21
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 cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240

X16700B_US seq list revised Natl 12May2005.ST25.txt

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ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
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gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
attctgcaaa	gtggttcctt	taatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
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gttaataaag	atgaagggac	agctttttta	gtctatgggt	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttggtg	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagttctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 22
 <211> 574
 <212> PRT
 <213> Homo sapiens

<220>
 <221> MISC_FEATURE
 <222> (1)..(574)
 <223> Human butyrylcholinesterase

<400> 22

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Phe Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 23
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 23
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaagatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca ttgcttttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttggtgtc 840
ccctatggga ctctttgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact 900
gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaagggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020

x16700B_US seq list revised Natl 12May2005.ST25.txt

aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 24
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (68)..(68)
 <223> N68K

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<400> 24

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Lys Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu

65 x16700B_US seq list revised Natl 12May2005.ST25.txt
 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<210> 25
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<400> 25
 gaagatgaca tcataattgc aacaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
 tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
 cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttgaa tgccacaaaa 180
 tatgcaaatt cttgctgtca gcggatagat caaagttttc caggcttcca tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
 gcacctaacc caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360
 ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
 ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaagggac agctttttta gtctatgggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
 tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
 gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620

x16700B_US seq list revised Natl 12May2005.ST25.txt

tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680

tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 26
<211> 574
<212> PRT
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<220>
<221> VARIANT
<222> (68)..(68)
<223> N68R

<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

<400> 26

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Arg Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400

x16700B_US seq list revised Natl 12May2005.ST25.txt

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 27
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 27
gaagatgaca tcataattgc acaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacataggg caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

X16700B_US seq list revised Natl 12May2005.ST25.txt

gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatagcag	cctttggtgg	aaatcctaaa	agtgtaactc	tctttggaga	aagtgcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
attctgcaaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctcctttgtc	agtaaacttt	ggtccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagttctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gacctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
tttaacgatt	acactagcaa	gaaagaaagt	tgtgtgggtc	tc		1722

<210> 28
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (70)..(70)
 <223> D70G

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<400> 28

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Gly Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

x16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatacat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840

X16700B_US seq list revised Natl 12May2005.ST25.txt

ccctatggga ctcctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
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<210> 30
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<220>
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 <222> (70)..(70)
 <223> D70H

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 <223> Xaa = Ala

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile His Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<212> DNA
<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt cggatcagag 240
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gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact 360
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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<210> 32
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 <212> PRT
 <213> Artificial

<220>
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<220>
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 <222> (77)..(77)
 <223> H77F

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn

370 x16700B_US seq list revised Natl 12May2005.ST25.txt 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<223> Synthetic butyrylcholinesterase variant

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtgggtg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagttttctg	ctcgggttga	aagagttatt	420
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aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Pro Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu

X16700B_US seq list revised Natl 12May2005.ST25.txt

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		275					280					285			
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	290					295					300				
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Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
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X16700B_US seq list revised Natl 12May2005.ST25.txt
 Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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<220>
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x16700B_US seq list revised Nat1 12May2005.ST25.txt

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gacatgccag	acataattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt	960
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aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 36
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (120)..(120)
 <223> T120W

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<400> 36

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Trp Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 37
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 37
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaatat 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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x167008_US seq list revised Natl 12May2005.ST25.txt

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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 38
<211> 574
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
<221> VARIANT
<222> (120)..(120)
<223> T120Y

<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

<400> 38

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Tyr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

x16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 39
<211> 1722
<212> DNA
<213> Artificial

<220>

X16700B_US seq list revised Natl 12May2005.ST25.txt
 <223> Synthetic butyrylcholinesterase variant

<400> 39
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 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
 gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360
 ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
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 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
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 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
 tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 40

x16700B_US seq list revised Natl 12May2005.ST25.txt

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

<220>

<221> VARIANT

<222> (282)..(282)

<223> Y282G

<400> 40

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

X16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Gly Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 41
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480

x16700B_US seq list revised Natl 12May2005.ST25.txt
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa 540
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 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttggtc 840
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 gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaagggac agctttttta gtctatggtg ctctgggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
 cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat 1260
 tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
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 ttctggacat catTTTTTcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
 tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
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<210> 42
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (282)..(282)
 <223> Y282N

<400> 42

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Asn Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 43
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 43
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacetgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga accctttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080

X16700B_US seq list revised Natl 12May2005.ST25.txt

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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agaacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
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<210> 44
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
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<223> Xaa = Ala

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<223> T284N

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<400> 44

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20          25          30

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35          40          45

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50          55          60

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65          70          75          80

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x16700B_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Asn Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

X16700B_US seq list revised Natl 12May2005.ST25.txt

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<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa      180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag      240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca      300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact      360
ggaacatcat ctttacetgt ttatgatggc aagtttcttg ctcgggttga aagagttatt      420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct      480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa      540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga      600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc      660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg      720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata      780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc      840
ccctatggga ctctttgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctccct      900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttgggtgggt      960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat     1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga     1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag     1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc     1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat     1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag     1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca     1440
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga     1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa     1620

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X16700B_US seq list revised Natl 12May2005.ST25.txt
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 <223> Synthetic butyrylcholinesterase variant

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 <223> Xaa = Ala

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 <222> (300)..(300)
 <223> T300P

<400> 46

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Pro Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

X16700B_US seq list revised Natl 12May2005.ST25.txt
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 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
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 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
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 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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<210> 48
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>

<221> VARIANT

<222> (284)..(284)

<223> T284R

<400> 48

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

x16700B_US seq list revised Natl 12May2005.ST25.txt

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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Arg	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
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Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
	450					455					460				
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro
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X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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ggaacatcat ctttacatgt ttatgatggc aagtttcttg ctcgggttga aagagttatt 420
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
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<210> 50
<211> 574
<212> PRT
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<220>
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<222> (227)..(227)
<223> Xaa = Ala

<220>
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<222> (284)..(284)
<223> T284S

<400> 50

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
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Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
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Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
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Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Ser	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Ser	Asp	Met	Pro	Asp
	290					295					300				

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

X16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact 360
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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ccctatgggt atcctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttgggtgggt 960
gttaataaag atgaagggac agctttttta gtctatgggt ctcctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
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x16700B_US seq list revised Natl 12May2005.ST25.txt
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 <223> Xaa = Ala

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Tyr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

X16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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<223> Synthetic butyrylcholinesterase variant

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x16700B_US seq list revised Natl 12May2005.ST25.txt

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atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtggtg	ttttcaaact	360
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 <223> Xaa = Ala

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 <223> P285N

<400> 54

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

x16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser

450 x16700B_US seq list revised Natl 12May2005.ST25.txt 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 56
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (285)..(285)
 <223> P285Q

<400> 56

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Asn	Leu	Thr	Val	Phe	Gly	Gly	Thr	Val	Thr	Ala	Phe	Leu	Gly	Ile	Pro
			20					25					30		

x16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Gln Leu Ser Val

X16700B_US seq list revised Natl 12May2005.ST25.txt
Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 57
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 57
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840
ccctatggga ctctgcgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260

x16700B_US seq list revised Natl 12May2005.ST25.txt

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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc	1722

<210> 58
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (286)..(286)
 <223> L286A

<400> 58

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp

Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Ala	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		

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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 59
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

X16700B_US seq list revised Natl 12May2005.ST25.txt

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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctgggtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttgggtgggt 960
gttaataaag atgaaggac agctttttta gtctatgggt ctcctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 60
<211> 574

X16700B_US seq list revised Natl 12May2005.ST25.txt

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

<220>

<221> VARIANT

<222> (286)..(286)

<223> L286G

<400> 60

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

x16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Gly Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

X16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 61
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 61
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540

X16700B_US seq list revised Natl 12May2005.ST25.txt

aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc	840
ccctatggga ctcctaagtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 62
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (286)..(286)
 <223> L286K

<400> 62

x16700B_US seq list revised Natl 12May2005.ST25.txt

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Asn	Leu	Thr	Val	Phe	Gly	Gly	Thr	Val	Thr	Ala	Phe	Leu	Gly	Ile	Pro
			20					25					30		
Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
		35					40					45			
Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
	50					55					60				
Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
				85					90					95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	

X16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Lys Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

x16700B_US seq list revised Natl 12May2005.ST25.txt

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 63
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 63
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctatgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020
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x16700B_US seq list revised Natl 12May2005.ST25.txt
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
 tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
 gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
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 ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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<210> 64
 <211> 574
 <212> PRT
 <213> Artificial

<220>
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<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (286)..(286)
 <223> L286M

<400> 64

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

X16700B_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Met Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

x16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 65

X16700B_US seq list revised Natl 12May2005.ST25.txt

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 65

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
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gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
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1722

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 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

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 <222> (286)..(286)
 <223> L286N

<400> 66

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Asn Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<223> synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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gttaataaag	atgaaggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
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gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaacccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 68
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

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X16700B_US seq list revised Natl 12May2005.ST25.txt

<221> VARIANT
<222> (286)..(286)
<223> L286R

<400> 68

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg

225	X16700B_US seq list revised Natl 12May2005.ST25.txt														240
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Glu	Thr	Glu	Ile 260	Ile	Lys	Cys	Leu	Arg 265	Asn	Lys	Asp	Pro	Gln 270	Glu	Ile
Leu	Leu	Asn 275	Glu	Ala	Phe	Val	Val 280	Pro	Tyr	Gly	Thr	Pro 285	Arg	Ser	Val
Asn	Phe 290	Gly	Pro	Thr	Val	Asp 295	Gly	Asp	Phe	Leu	Thr 300	Asp	Met	Pro	Asp
Ile 305	Leu	Leu	Glu	Leu	Gly 310	Gln	Phe	Lys	Lys	Thr 315	Gln	Ile	Leu	Val	Gly 320
Val	Asn	Lys	Asp	Glu 325	Gly	Thr	Ala	Phe	Leu 330	Val	Tyr	Gly	Ala	Pro 335	Gly
Phe	Ser	Lys	Asp 340	Asn	Asn	Ser	Ile	Ile 345	Thr	Arg	Lys	Glu	Phe 350	Gln	Glu
Gly	Leu	Lys 355	Ile	Phe	Phe	Pro	Gly 360	Val	Ser	Glu	Phe	Gly 365	Lys	Glu	Ser
Ile 370	Leu	Phe	His	Tyr	Thr	Asp 375	Trp	Val	Asp	Asp	Gln 380	Arg	Pro	Glu	Asn
Tyr 385	Arg	Glu	Ala	Leu	Gly 390	Asp	Val	Val	Gly	Asp 395	Tyr	Asn	Phe	Ile	Cys 400
Pro	Ala	Leu	Glu	Phe 405	Thr	Lys	Lys	Phe	Ser 410	Glu	Trp	Gly	Asn	Asn 415	Ala
Phe	Phe	Tyr	Tyr 420	Phe	Glu	His	Arg	Ser 425	Ser	Lys	Leu	Pro	Trp 430	Pro	Glu
Trp	Met	Gly 435	Val	Met	His	Gly	Tyr 440	Glu	Ile	Glu	Phe	Val 445	Phe	Gly	Leu
Pro	Leu 450	Glu	Arg	Arg	Asp	Asn 455	Tyr	Thr	Lys	Ala	Glu 460	Glu	Ile	Leu	Ser
Arg 465	Ser	Ile	Val	Lys	Arg 470	Trp	Ala	Asn	Phe	Ala 475	Lys	Tyr	Gly	Asn	Pro 480

X16700B_US seq list revised Natl 12May2005.ST25.txt
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 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 69
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<400> 69
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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
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 atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
 ccctatggga ctcttttggt tgtaaaacttt ggtccgaccg tggatggtga ttttctcact 900

X16700B_US seq list revised Natl 12May2005.ST25.txt

gacatgccag acatattact tgaacttgga caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 70
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (287)..(287)
 <223> S287F

<400> 70

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser

50 x16700B_US seq list revised Natl 12May2005.ST25.txt 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Phe Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

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Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	305	310	315	320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly		325	330	335
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu		340	345	350
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser		355	360	365
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn		370	375	380
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys		385	390	395
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala		405	410	415
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu		420	425	430
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu		435	440	445
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser		450	455	460
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro		465	470	475
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr		485	490	495
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr		500	505	510
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys		515	520	525
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp	Lys		530	535	540
Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln		545	550	555

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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 71
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 71
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tttggtggca cggtaacagc ctttcttggga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttgaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctcttttgca tgtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaaatat 1500

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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
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 tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 72
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (287)..(287)
 <223> S287H

<400> 72

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
130						135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	His	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				

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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 73
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 73
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180

x16700B_US seq list revised Natl 12May2005.ST25.txt

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gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
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aatatagcag	cctttggtgg	aaatcctaaa	agtgtiaactc	tctttggaga	aagtgcagga	600
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gttaataaag	atgaagggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagtcttca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaacccttg	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
tttaacgatt	acactagcaa	gaaagaaagt	tgtgtgggtc	tc		1722

<210> 74
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (287)..(287)
 <223> S287R

<400> 74

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Arg Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

x16700B_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 75
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 75
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtggtgg ttttcaaact 360
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gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattggt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720

x16700B_US seq list revised Natl 12May2005.ST25.txt
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 ccctatggga ctcttttgac tgtaaacttt ggtccgaccg tggatggtga ttttctcact 900
 gacatgccag acatattact tgaacttgga caatttataa aaaccagat tttggtgggt 960
 gttaataaag atgaaggagc agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
 cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat 1260
 tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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<210> 76
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (287)..(287)
 <223> S287T

<400> 76

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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X16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Thr Val
275 280 285

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys

530 X16700B_US seq list revised Natl 12May2005.ST25.txt 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 77
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa 540
aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggggc tgctttttta gtctatggtg ctcttggtt cagcaaagat 1020
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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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x16700B_US seq list revised Natl 12May2005.ST25.txt

gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
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aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 78
<211> 574
<212> PRT
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<220>
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<220>
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<222> (227)..(227)
<223> Xaa = Ala

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<223> T327A

<400> 78

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

x16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Ala Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser

x16700B_US seq list revised Natl 12May2005.ST25.txt
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 79
 <211> 1722
 <212> DNA
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<220>
 <223> synthetic butyrylcholinesterase variant

X16700B_US seq list revised Natl 12May2005.ST25.txt

<400> 79						
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tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttcca	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtgggtg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	gggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagt	ggttcaaaaa	540
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gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattgtt	caccagagcc	660
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atcaagtgtc	ttagaaataa	agatcccca	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctcctttgtc	agtaaacttt	gggccgaccg	tggatgggtga	ttttctcact	900
gacatgccag	acataattact	tgaacttgga	caatttataa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggcc	tgctttttta	gtctatgggtg	ctcctggctt	cagcaaagat	1020
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 <211> 574
 <212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

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<221> VARIANT

<222> (327)..(327)

<223> T327P

<400> 80

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Pro Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

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 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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X16700B_US seq list revised Natl 12May2005.ST25.txt

aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
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atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc	840
ccctatggga ctctttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
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gttaataaag atgaagggac agctctttta gtctatggtg ctcttggtt cagcaaagat	1020
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

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 <212> PRT
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<220>
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 <223> Xaa = Ala

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 <223> F329L

<400> 82

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met

1 x16700B_US seq list revised Natl 12May2005.ST25.txt
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 20 25 30
 Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45
 Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Leu Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

x16700B_US seq list revised Natl 12May2005.ST25.txt

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 83
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 83
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ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
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aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 84
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
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<222> (227)..(227)
<223> Xaa = Ala

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<220>
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<400> 84

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35          40          45

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65          70          75          80

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X16700B_US seq list revised Natl 12May2005.ST25.txt
Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His' Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Ser Val Tyr Gly Ala Pro Gly
325 330 335

x16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 85
<211> 1722

X16700B_US seq list revised Natl 12May2005.ST25.txt

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 85

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gttaataaag atgaagggac agctttttta gcgtatgggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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x16700B_US seq list revised Natl 12May2005.ST25.txt
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1722

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<220>
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<223> Xaa = Ala

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<222> (331)..(331)
<223> V331A

<400> 86

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

x16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<223> Synthetic butyrylcholinesterase variant

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 88
 <211> 574
 <212> PRT
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 <223> Synthetic butyrylcholinesterase variant

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 <223> Xaa = Ala

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X16700B_US seq list revised Natl 12May2005.ST25.txt
<222> (331)..(331)
<223> V331G

<400> 88

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

X16700B_US seq list revised Natl 12May2005.ST25.txt

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245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Gly Tyr Gly Ala Pro Gly
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<220>
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<400> 89
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
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<210> 90
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
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<223> Xaa = Ala

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<220>
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<222> (331)..(331)
<223> V331P

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<400> 90

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20          25          30

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35          40          45

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50          55          60

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x16700B_US seq list revised Natl 12May2005.ST25.txt

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly

305 X16700B_US seq list revised Natl 12May2005.ST25.txt
 310 315 320
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Pro Tyr Gly Pro Pro Gly
 325 330 335
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415
 Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430
 Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445
 Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460
 Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480
 Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495
 Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510
 Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525
 Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540
 Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

X16700B_US seq list revised Natl 12May2005.ST25.txt
Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 91
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtg ttttcaaact 360
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atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctcttttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaagggac agctttttta tcttatgggtg ctcttggtt cagcaaagat 1020
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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500

x16700B_US seq list revised Natl 12May2005.ST25.txt
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 tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 92
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 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <223> Xaa = Ala

<220>
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 <222> (331)..(331)
 <223> V331S

<400> 92

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met

130 x16700B_US seq list revised Natl 12May2005.ST25.txt 140

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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ser Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

X16700B_US seq list revised Natl 12May2005.ST25.txt
Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<223> Synthetic butyrylcholinesterase variant

<400> 93
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180

X16700B_US seq list revised Natl 12May2005.ST25.txt

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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
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gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttggtgggt	960
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 94
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>

X16700B_US seq list revised Natl 12May2005.ST25.txt

<221> VARIANT
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<223> Xaa = Ala

<220>
<221> VARIANT
<222> (331)..(331)
<223> V331T

<400> 94

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

x16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Thr Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

x16700B_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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<223> Synthetic butyrylcholinesterase variant

<400> 95
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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gacatgccag	acataattact	tgaacttgga	caattttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtcgcgggtg	ctcctggctt	cagcaaagat	1020
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gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
tttaacgatt	acactagcaa	gaaagaaagt	tgtgtgggtc	tc		1722

<210> 96
 <211> 574
 <212> PRT
 <213> Artificial

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 <223> synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (332)..(332)
 <223> Y332A

<400> 96

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Asn	Leu	Thr	Val	Phe	Gly	Gly	Thr	Val	Thr	Ala	Phe	Leu	Gly	Ile	Pro
			20				25						30		

X16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Ala Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

x16700B_US seq list revised Natl 12May2005.ST25.txt

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtcgggggtg ctcttggtt cagcaaagat 1020
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x16700B_US seq list revised Natl 12May2005.ST25.txt
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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Gly Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
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x16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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<212> DNA

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<223> Synthetic butyrylcholinesterase variant

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

x16700B_US seq list revised Natl 12May2005.ST25.txt

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Leu Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<223> Xaa = Ala
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile

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Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr
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X16700B_US seq list revised Natl 12May2005.ST25.txt
Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

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565 570

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aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata		780
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gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt		960
gttaataaag	atgaagggac	agctttttta	gtctgggggtg	ctcctggctt	cagcaaagat		1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga		1080
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x16700B_US seq list revised Natl 12May2005.ST25.txt

agacctgaaa actaccgtga ggccttgggt gatgttggtt gggattataa tttcatatgc	1200
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 104
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (332)..(332)
 <223> Y332W

<400> 104

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Trp Gly Ala Pro Gly
325 330 335

X16700B_US seq list revised Natl 12May2005.ST25.txt
Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 105
<211> 1722
<212> DNA

X16700B_US seq list revised Natl 12May2005.ST25.txt
<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 105

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctttgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttgggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
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tttgaacacc gatcctcaa acttaagtgg ccagaatgga tgggagtgat gcatggctat	1320
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

x16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 106
 <211> 574
 <212> PRT
 <213> Artificial

<220>
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<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (429)..(429)
 <223> P429K

<400> 106

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

x16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Lys Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 107
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 107
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420

X16700B_US seq list revised Natl 12May2005.ST25.txt

gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
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atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggg caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaaggagc agctttttta gtctatgggt ctctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 108
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (429)..(429)

X16700B_US seq list revised Natl 12May2005.ST25.txt

<223> P429L

<400> 108

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Arg Thr Leu Asn₂₄₅ Leu Ala Lys Leu Thr₂₅₀ Gly Cys Ser Arg Glu₂₅₅ Asn

Glu Thr Glu Ile₂₆₀ Ile Lys Cys Leu Arg₂₆₅ Asn Lys Asp Pro Gln₂₇₀ Glu Ile

Leu Leu Asn₂₇₅ Glu Ala Phe Val₂₈₀ Pro Tyr Gly Thr Pro₂₈₅ Leu Ser Val

Asn Phe₂₉₀ Gly Pro Thr Val₂₉₅ Asp Gly Asp Phe Leu Thr₃₀₀ Asp Met Pro Asp

Ile₃₀₅ Leu Leu Glu Leu Gly₃₁₀ Gln Phe Lys Lys Thr₃₁₅ Gln Ile Leu Val Gly₃₂₀

Val Asn Lys Asp Glu₃₂₅ Gly Thr Ala Phe Leu₃₃₀ Val Tyr Gly Ala Pro₃₃₅ Gly

Phe Ser Lys Asp₃₄₀ Asn Asn Ser Ile Ile₃₄₅ Thr Arg Lys Glu Phe₃₅₀ Gln Glu

Gly Leu Lys₃₅₅ Ile Phe Phe Pro Gly₃₆₀ Val Ser Glu Phe Gly₃₆₅ Lys Glu Ser

Ile Leu₃₇₀ Phe His Tyr Thr Asp₃₇₅ Trp Val Asp Asp Gln₃₈₀ Arg Pro Glu Asn

Tyr₃₈₅ Arg Glu Ala Leu Gly₃₉₀ Asp Val Val Gly Asp₃₉₅ Tyr Asn Phe Ile Cys₄₀₀

Pro Ala Leu Glu Phe₄₀₅ Thr Lys Lys Phe Ser₄₁₀ Glu Trp Gly Asn Asn₄₁₅ Ala

Phe Phe Tyr Tyr₄₂₀ Phe Glu His Arg Ser₄₂₅ Ser Lys Leu Leu Trp₄₃₀ Pro Glu

Trp Met Gly₄₃₅ Val Met His Gly Tyr₄₄₀ Glu Ile Glu Phe Val₄₄₅ Phe Gly Leu

Pro Leu₄₅₀ Glu Arg Arg Asp Asn₄₅₅ Tyr Thr Lys Ala Glu₄₆₀ Glu Ile Leu Ser

Arg₄₆₅ Ser Ile Val Lys Arg₄₇₀ Trp Ala Asn Phe Ala₄₇₅ Lys Tyr Gly Asn Pro₄₈₀

Asn Glu Thr Gln Asn₄₈₅ Asn Ser Thr Ser Trp₄₉₀ Pro Val Phe Lys Ser₄₉₅ Thr

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 109

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 109

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaacc caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
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atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc	840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt	960

X16700B_US seq list revised Natl 12May2005.ST25.txt

gttaataaag atgaagggac agctttttta gtctatgggtg ctcctggcctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggtt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtt gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttcagtggt ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 110
 <211> 574
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 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (429)..(429)
 <223> P429Q

<400> 110

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

X16700B_US seq list revised Natl 12May2005.ST25.txt

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255
 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285
 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300
 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Gln Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu

<210> 111
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 111
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cttttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
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ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttgggtgggt 960
gttaataaag atgaagggac agctttttta gtctatgggtg ctcttggtt cagcaaagat 1020
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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
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aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 112
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (429)..(429)
 <223> P429R

<400> 112

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys

385 390 395 400

Pro'Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Arg Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210>	113
<211>	1722
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<220>
<223> Synthetic butyrylcholinesterase variant

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<400> 113
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
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gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
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atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctcctttgtc	agtaaacttt	ggtccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttggg	caatttataa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtctatgggt	ctcctggctt	cagcaaagat	1020
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cctgccttgg	agttcaccaa	gaagtcttca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	actttcgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 114

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

x16700B_US seq list revised Natl 12May2005.ST25.txt
<222> (227)..(227)
<223> Xaa = Ala

<220>
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<222> (429)..(429)
<223> P429S

<400> 114

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser

210 x16700B_US seq list revised Natl 12May2005.ST25.txt 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Ser Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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 <211> 1722
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 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780

x16700B_US seq list revised Natl 12May2005.ST25.txt

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gacatgccag acatattact tgaacttgga caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
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ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 116
 <211> 574
 <212> PRT
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 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (429)..(429)
 <223> P429T

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Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
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Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
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Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
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Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
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X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
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305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
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Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Thr	Trp	Pro	Glu
			420					425					430		
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
		435					440					445			
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
	450					455					460				
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro
465					470					475					480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr
				485					490					495	
Glu	Gln	Lys	Tyr	Leu	Thr	Leu	Asn	Thr	Glu	Ser	Thr	Arg	Ile	Met	Thr
			500					505					510		
Lys	Leu	Arg	Ala	Gln	Gln	Cys	Arg	Phe	Trp	Thr	Ser	Phe	Phe	Pro	Lys
		515					520					525			
Val	Leu	Glu	Met	Thr	Gly	Asn	Ile	Asp	Glu	Ala	Glu	Trp	Glu	Trp	Lys
	530					535					540				

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 117
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 117
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttgggtgggt 960
gttaataaag atgaagggac agctttttta gtctatgggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat 1260
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x16700B_US seq list revised Natl 12May2005.ST25.txt

gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
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ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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<210> 118
<211> 574
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
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<222> (227)..(227)
<223> Xaa = Ala

<220>
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<223> P429V

<400> 118

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

x16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Val Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 119
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 119
gaagatgaca tcataattgc aacaaagaat ggaaaagtca gagggatgaa cttgacagtt

X16700B_US seq list revised Natl 12May2005.ST25.txt

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tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttcca	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtgggtg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagttttctg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
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<210> 120
 <211> 574
 <212> PRT
 <213> Artificial

X16700B_US seq list revised Natl 12May2005.ST25.txt

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<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

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<221> VARIANT

<222> (430)..(430)

<223> W430M

<400> 120

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

X16700B_US seq list revised Natl 12May2005.ST25.txt

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Met Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

X16700B_US seq list revised Natl 12May2005.ST25.txt

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa 540
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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gttaataaag	atgaaggac	agctttttta	gtctatgggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
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cctgccttgg	agttcaccaa	gaagtctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtat	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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 <212> PRT
 <213> Artificial

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 <222> (227)..(227)
 <223> Xaa = Ala

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 <223> W430Y

<400> 122

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x16700B_US seq list revised Natl 12May2005.ST25.txt

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

x16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Tyr Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
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<220>
<223> Synthetic butyrylcholinesterase variant

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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 124
<211> 574
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
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<222> (227)..(227)
<223> Xaa = Ala
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<223> P431Q
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20 25 30
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45
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```
Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95
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x16700B_US seq list revised Natl 12May2005.ST25.txt

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Gln Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 125
<211> 1722
<212> DNA
<213> Artificial

x16700B_US seq list revised Natl 12May2005.ST25.txt

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 125

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
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atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttgggtgggt	960
gttaataaag atgaagggac agctttttta gtctatgggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
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tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

X16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 126
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

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 <222> (433)..(433)
 <223> W433G

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

x16700B_US seq list revised Natl 12May2005.ST25.txt
Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
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Gly Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
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<220>
<223> Synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
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x16700B_US seq list revised Natl 12May2005.ST25.txt						
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gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
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gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttgggtgggt	960
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gaaattttga	gtagatccat	agtgaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
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 <212> PRT
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 <223> Synthetic butyrylcholinesterase variant

<220>
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 <223> Xaa = Ala

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

x16700B_US seq list revised Natl 12May2005.ST25.txt
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Phe Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
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<223> Synthetic butyrylcholinesterase variant

<400> 129
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
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gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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 <223> Xaa = Ala

<220>
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 <222> (434)..(434)
 <223> M434G

<400> 130

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

x16700B_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Gly Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

X16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 131
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<400> 131
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 cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttgaa tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
 gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
 ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840
 ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
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 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560

X16700B_US seq list revised Natl 12May2005.ST25.txt
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
 tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 ttttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 132
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (434)..(434)
 <223> M434K

<400> 132

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

x16700B_US seq list revised Natl 12May2005.ST25.txt

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Lys Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 133
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 133
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240

X16700B_US seq list revised Natl 12May2005.ST25.txt

atgtggaacc	caaacactga	cctcagtgaa	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtggtg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatagcag	cctttggtgg	aaatcctaaa	agtgtaactc	tctttggaga	aagtgcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
attctgcaaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctcctttgtc	agtaaacttt	gggccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
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cctgccttgg	agttcaccaa	gaagtctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatggc	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 134
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)

x16700B_US seq list revised Natl 12May2005.ST25.txt

<223> Xaa = Ala

<220>

<221> VARIANT

<222> (434)..(434)

<223> M434L

<400> 134

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

X16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Leu Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

- <210> 135
- <211> 1722
- <212> DNA
- <213> Artificial

- <220>
- <223> Synthetic butyrylcholinesterase variant

<400> 135
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttggtgtc 840

x16700B_US seq list revised Natl 12May2005.ST25.txt

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ccctatggga ctcctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
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gttaataaag atgaaggac agctttttta gtctatgggtg ctcctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
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<210> 136
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

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<220>
<221> VARIANT
<222> (434)..(434)
<223> M434N

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<400> 136

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Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
          20          25          30

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
          35          40          45

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x16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp

290 X16700B_US seq list revised Natl 12May2005.ST25.txt
295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Asn Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ala	Gly	Phe	His	Arg	Trp	Asn	Asn	Tyr	Met	Met	Asp	Trp	Lys	Asn	Gln
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<210> 137
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

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	cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa	180
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	atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
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	ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt	420
	gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
	gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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	ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact	900
	gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt	960
	gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
	aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
	gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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	tttgaacacc gatcctcaa acttccgtgg ccagaatggt cgggagtgat gcatggctat	1320
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x16700B_US seq list revised Natl 12May2005.ST25.txt
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<210> 138
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 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

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 <222> (434)..(434)
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr

x16700B_US seq list revised Natl 12May2005.ST25.txt
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Ser Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 139
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 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<400> 139
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x16700B_US seq list revised Natl 12May2005.ST25.txt						
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gacatgccag	acatattact	tgaacttgg	caatttaaaa	aaaccagat	tttgggtgggt	960
gttaataaag	atgaagggac	agctttttta	gtctatgggt	ctcctggctt	cagcaaagat	1020
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gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
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cctgccttgg	agttcaccaa	gaagtcttca	gaatggggaa	ataatgcctt	tttctactat	1260
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<210> 140
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x167008_US seq list revised Natl 12May2005.ST25.txt
<223> Synthetic butyrylcholinesterase variant

<220>
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<223> Xaa = Ala

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<223> M434W

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

x16700B_US seq list revised Natl 12May2005.ST25.txt

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Trp Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

x16700B_US seq list revised Natl 12May2005.ST25.txt

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<211> 1722
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<220>
<223> Synthetic butyrylcholinesterase variant

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 142
 <211> 574
 <212> PRT
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 <223> Xaa = Ala

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 <223> G435C

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x167008_US seq list revised Natl 12May2005.ST25.txt

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

X16700B_US seq list revised Natl 12May2005.ST25.txt

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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Cys Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 144
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<212> PRT
<213> Artificial

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<220>
<223> synthetic butyrylcholinesterase variant

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<220>
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<222> (227)..(227)
<223> Xaa = Ala

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<222> (437)..(437)
<223> M437G

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<400> 144

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35           40           45

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50           55           60

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65           70           75           80

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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85           90           95

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X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

x16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Gly His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 145
<211> 1722
<212> DNA
<213> Artificial

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 145

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
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tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

x16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 146
<211> 574
<212> PRT
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<220>
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<223> Xaa = Ala

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<222> (437)..(437)
<223> M437I

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

x16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu

Trp Met Gly Val Ile His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 147
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 147
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacetgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480

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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc	840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaagggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <223> Xaa = Ala

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 <222> (439)..(439)
 <223> G439T

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn

Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala
				405					410					415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu
			420					425					430		
Trp	Met	Gly	Val	Met	His	Thr	Tyr	Glu	Ile	Glu	Phe	Val	Phe	Gly	Leu
		435					440					445			
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser
	450					455					460				
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro
465					470					475					480
Asn	Glu	Thr	Gln	Asn	Asn	Ser	Thr	Ser	Trp	Pro	Val	Phe	Lys	Ser	Thr
				485					490					495	

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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 149
<211> 1722
<212> DNA
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<220>
<223> synthetic butyrylcholinesterase variant

<400> 149

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
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ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat	1020

x16700B_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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 <223> Xaa = Ala

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 <222> (440)..(440)
 <223> Y440A

<400> 150

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu

65

70

75

80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

x16700B_US seq list revised Natl 12May2005.ST25.txt
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Ala Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

x16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 151
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<400> 151
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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
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 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
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 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080
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 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<220>

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<223> Xaa = Ala

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<223> Y440E

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

x16700B_US seq list revised Natl 12May2005.ST25.txt

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			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
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225					230					235					240
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Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
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Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
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X16700B_US seq list revised Natl 12May2005.ST25.txt

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Glu Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 153
<211> 1722
<212> DNA
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<220>
<223> synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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 <223> Synthetic butyrylcholinesterase variant

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 <223> Xaa = Ala

x16700B_US seq list revised Natl 12May2005.ST25.txt

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 <223> Y440F

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

x16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Phe Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

X16700B_US seq list revised Natl 12May2005.ST25.txt

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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

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<223> Synthetic butyrylcholinesterase variant

<400> 155
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X16700B_US seq list revised Natl 12May2005.ST25.txt

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 <223> Xaa = Ala

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 <223> Y440G

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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 35 40 45

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
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Trp Met Gly Val Met His Gly Gly Glu Ile Glu Phe Val Phe Gly Leu
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln

545 X16700B_US seq list revised Natl 12May2005.ST25.txt 550 555 560

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gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttgggtgggt 960
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<210> 158
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

X16700B_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn

370 x167008_US seq list revised Natl 12May2005.ST25.txt 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly His Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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<213> Artificial

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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atgtggaacc	caaacactga	cctcagtgaa	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atgggtgggtg	ttttcaaact	360
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gaaattttga	gtagatccat	agtgaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
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<210> 160

<211> 574

<212> PRT

<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

x16700B_US seq list revised Natl 12May2005.ST25.txt

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 <223> Xaa = Ala

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 <222> (440)..(440)
 <223> Y440L

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Leu Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

X16700B_US seq list revised Natl 12May2005.ST25.txt
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 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<220>
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 <223> Xaa = Ala

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 <223> Y440M

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

X16700B_US seq list revised Natl 12May2005.ST25.txt

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Met Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

X16700B_US seq list revised Natl 12May2005.ST25.txt

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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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<220>
<223> Synthetic butyrylcholinesterase variant

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<223> Xaa = Ala

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<223> Y440N

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<400> 164

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35          40          45

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50          55          60

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85          90          95

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X16700B_US seq list revised Natl 12May2005.ST25.txt

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115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

x16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Asn Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 165
<211> 1722
<212> DNA
<213> Artificial

<220>

X16700B_US seq list revised Natl 12May2005.ST25.txt
 <223> Synthetic butyrylcholinesterase variant

<400> 165
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 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
 gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
 ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctctgggtga aagagttatt 420
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840
 ccctatggga ctcttttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900
 gacatgccag acatattact tgaacttggc caatttataa aaaccagat tttggtgggt 960
 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
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 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
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 tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 166

x16700B_US seq list revised Natl 12May2005.ST25.txt
 <211> 574
 <212> PRT
 <213> Artificial
 <220>
 <223> Synthetic butyrylcholinesterase variant
 <220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala
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 <221> VARIANT
 <222> (440)..(440)
 <223> Y440Q
 <400> 166
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 Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30
 Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45
 Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

X16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

X16700B_US seq list revised Natl 12May2005.ST25.txt

Trp Met Gly Val Met His Gly Gln Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 167
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<400> 167
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480

X16700B_US seq list revised Natl 12May2005.ST25.txt

gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa	540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctcttttgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaagggac agctttttta gtctatgggt ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggcagg	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 168
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

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 <222> (440)..(440)
 <223> Y440R

<400> 168

X16700B_US seq list revised Natl 12May2005.ST25.txt

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

x16700B_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Arg Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 169
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 169
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840
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gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttgggtgggt 960
gttaataaag atgaaggac agctttttta gtctatgggtg ctctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080

X16700B_US seq list revised Natl 12May2005.ST25.txt

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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctct 1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722
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<210> 170
<211> 574
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
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<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala
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<222> (440)..(440)
<223> Y440S
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<400> 170
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20 25 30
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```
Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45
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```
Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80
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X16700B_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly

x16700B_US seq list revised Natl 12May2005.ST25.txt
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Ser Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

x16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 171
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<400> 171
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 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
 ccctatggga ctcttttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900
 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
 tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggcact 1320
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
 ttctggacat catTTTTTCC aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620

X16700B_US seq list revised Natl 12May2005.ST25.txt
 tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa 1680
 ttttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 172
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (440)..(440)
 <223> Y440T

<400> 172

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

x16700B_US seq list revised Natl 12May2005.ST25.txt

145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly
				325					330					335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu
			340					345					350		
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser
		355					360					365			
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn
	370					375					380				
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys
385					390					395					400

x16700B_US seq list revised Natl 12May2005.ST25.txt
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Thr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 173
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<400> 173
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 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

X16700B_US seq list revised Natl 12May2005.ST25.txt

gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
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gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctcttttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
actattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 174
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

x16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
 <221> VARIANT
 <222> (441)..(441)
 <223> E441T

<400> 174

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

X167008_US seq list revised Natl 12May2005.ST25.txt

Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg	225	230	235	240
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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile	260	265	270	
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val	275	280	285	
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp	290	295	300	
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	305	310	315	320
Val	Asn	Lys	Asp	Glu	Gly	Thr	Ala	Phe	Leu	Val	Tyr	Gly	Ala	Pro	Gly	325	330	335	
Phe	Ser	Lys	Asp	Asn	Asn	Ser	Ile	Ile	Thr	Arg	Lys	Glu	Phe	Gln	Glu	340	345	350	
Gly	Leu	Lys	Ile	Phe	Phe	Pro	Gly	Val	Ser	Glu	Phe	Gly	Lys	Glu	Ser	355	360	365	
Ile	Leu	Phe	His	Tyr	Thr	Asp	Trp	Val	Asp	Asp	Gln	Arg	Pro	Glu	Asn	370	375	380	
Tyr	Arg	Glu	Ala	Leu	Gly	Asp	Val	Val	Gly	Asp	Tyr	Asn	Phe	Ile	Cys	385	390	395	400
Pro	Ala	Leu	Glu	Phe	Thr	Lys	Lys	Phe	Ser	Glu	Trp	Gly	Asn	Asn	Ala	405	410	415	
Phe	Phe	Tyr	Tyr	Phe	Glu	His	Arg	Ser	Ser	Lys	Leu	Pro	Trp	Pro	Glu	420	425	430	
Trp	Met	Gly	Val	Met	His	Gly	Tyr	Thr	Ile	Glu	Phe	Val	Phe	Gly	Leu	435	440	445	
Pro	Leu	Glu	Arg	Arg	Asp	Asn	Tyr	Thr	Lys	Ala	Glu	Glu	Ile	Leu	Ser	450	455	460	
Arg	Ser	Ile	Val	Lys	Arg	Trp	Ala	Asn	Phe	Ala	Lys	Tyr	Gly	Asn	Pro	465	470	475	480

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 175
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 175
gaagatgaca tcataattgc acaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cttttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctctttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900

X16700B_US seq list revised Natl 12May2005.ST25.txt

gacatgccag acatattact tgaacttgga caatttataaa aaacccagat tttggtgggt 960
gttaataaag atgaagggac agctttttta gtctatgggtg ctcctggctt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
gaactggaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 176
<211> 574
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

<220>
<221> VARIANT
<222> (442)..(442)
<223> I442L

<400> 176

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

x167008_US seq list revised Natl 12May2005.ST25.txt

Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
50						55					60				
Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
				85					90					95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				

x167008_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Leu Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

x16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 177
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 177
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaagatagat caaagttttc caggcttctt tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctaatttgct agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaagggac agctttttta gcgtatggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
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tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440

x16700B_US seq list revised Natl 12May2005.ST25.txt

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ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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 <223> V331A

<400> 178

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

X16700B_US seq list revised Natl 12May2005.ST25.txt

Cys	Cys	Gln	Lys	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	Phe	Gly	Ser	Glu
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Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
			100					105					110		
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
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Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Asn	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
	290					295					300				
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly
305					310					315					320

X16700B_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

X16700B_US seq list revised Natl 12May2005.ST25.txt

<210> 179
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 <212> DNA
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<220>
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 cttcgattca aaaagccaca gtctctgacc aagtggctctg atattttgaa tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
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 ggaacatcat ctttacatgt ttatgatggc aagtttcttg ctcgggttga aagagttatt 420
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
 aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
 atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840
 ccctatggga ctaatttgct agtaaacttt ggtccgaccg tggatgggtga ttttctcact 900
 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960
 gttaataaag atgaaggac agctttttta gcgtatgggt ctcctggctt cagcaaagat 1020
 aacaatagta tcataactag aaaagaattt caggaagggt taaaatatt tttccagga 1080
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
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 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
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X16700B_US seq list revised Natl 12May2005.ST25.txt
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 ttttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

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 <223> Xaa = Ala

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 <223> P285N

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 <223> V331A

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

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 <212> DNA
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<220>
 <223> synthetic butyrylcholinesterase variant

X16700B_US seq list revised Natl 12May2005.ST25.txt

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240
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<210> 182
<211> 574

x16700B_US seq list revised Natl 12May2005.ST25.txt

<212> PRT

<213> Artificial

<220>

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<220>

<221> VARIANT

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<223> H77F

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<223> Xaa = Ala

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<223> P285N

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<221> VARIANT

<222> (434)..(434)

<223> M434L

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20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr

x16700B_US seq list revised Natl 12May2005.ST25.txt
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365

X16700B_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Leu Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
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X16700B_US seq list revised Natl 12May2005.ST25.txt						
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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x16700B_US seq list revised Natl 12May2005.ST25.txt
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<221> VARIANT
<222> (77)..(77)
<223> H77F

<220>
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<223> Xaa = Ala

<220>
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<222> (285)..(285)
<223> P285N

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<221> VARIANT
<222> (331)..(331)
<223> V331A

<220>
<221> VARIANT
<222> (429)..(429)
<223> P429R

<400> 184

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met

130 x16700B_US seq list revised Natl 12May2005.ST25.txt 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Arg Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 185
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<400> 185
 gaagatgaca tcataattgc aacaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
 tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
 cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180

X16700B_US seq list revised Natl 12May2005.ST25.txt

tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttctt	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaatgg	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatagcag	cctttggtgg	aaatcctaaa	agtgtaaactc	tctttggaga	aagtgcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattggt	caccagagcc	660
attctgcaaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctaatttgtc	agtaaacttt	ggtccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttgga	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gcgtatggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagtctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 186

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

X16700B_US seq list revised Natl 12May2005.ST25.txt

<221> VARIANT
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<223> H77F

<220>
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<223> T120W

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<223> Xaa = Ala

<220>
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<222> (285)..(285)
<223> P285N

<220>
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<222> (331)..(331)
<223> V331A

<400> 186

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Trp Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

145 150 155 160
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
 225 230 235 240
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
 245 250 255
 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
 260 265 270
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
 275 280 285
 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
 290 295 300
 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
 305 310 315 320
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
 325 330 335
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
 340 345 350
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
 355 360 365
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
 370 375 380
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
 385 390 395 400

X16700B_US seq list revised Natl 12May2005.ST25.txt
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
 565 570

<210> 187
 <211> 1722
 <212> DNA
 <213> Artificial

<220>
 <223> synthetic butyrylcholinesterase variant

<400> 187
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 tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

x16700B_US seq list revised Natl 12May2005.ST25.txt

gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtggtgg ttttcaaact	360
ggaacatcat ctttacatgt ttatgatggc aagtttcttg ctcgggttga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctaatttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggg caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaagggac agctttttta gcgtatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggccag	1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 188
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (77)..(77)
 <223> H77F

X16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
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 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (285)..(285)
 <223> P285N

<220>
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 <222> (331)..(331)
 <223> V331A

<220>
 <221> VARIANT
 <222> (440)..(440)
 <223> Y440Q

<400> 188

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

X16700B_US seq list revised Natl 12May2005.ST25.txt
Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Gln Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 189
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 189
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420

x16700B_US seq list revised Natl 12May2005.ST25.txt

gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttcctt taatgctcct tgggcggtaa catctcttta tgaagctagg	720
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atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagt ctttgttgtc	840
ccctatggga ctctcttgtc agtaaacctt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tattatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccctga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 190
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
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 <222> (277)..(277)
 <223> A277V

<220>
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 <222> (285)..(285)
 <223> P285L

x16700B_US seq list revised Natl 12May2005.ST25.txt

<220>
 <221> VARIANT
 <222> (398)..(398)
 <223> F398I

<400> 190

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
 210 215 220

X16700B_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Phe Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Val Phe Val Val Pro Tyr Gly Thr Leu Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Ile Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 191
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 191
gaagatgaca tcataattgc aacaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa 540
aatatagcag ctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840

X16700B_US seq list revised Natl 12May2005.ST25.txt

ccctatggga ctcctggggtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttggga caatttataaa aaaccagat tttggtgggt	960
gttaataaag atgaagggac agcttttttta gtctcgggtg ctcctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 192
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
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 <222> (286)..(286)
 <223> L286G

<220>
 <221> VARIANT
 <222> (332)..(332)
 <223> Y332S

<400> 192

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
 1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

X16700B_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Gly Ser Val

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Ser Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

X16700B_US seq list revised Natl 12May2005.ST25.txt
Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 193
<211> 1722
<212> DNA
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<400> 193
gaagatgaca tcataattgc aacaaagaat ggaaaagtca gagggatgaa cttgacagtt 60
tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840
ccctatggga ctcttttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900
gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt 960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260

x16700B_US seq list revised Natl 12May2005.ST25.txt

tttgaacacc gatcctccaa acttctcttg ccagaatggg ttggagtgat gcatggctat	1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc	1722

<210> 194
 <211> 574
 <212> PRT
 <213> Artificial

<220>
 <223> Synthetic butyrylcholinesterase variant

<220>
 <221> VARIANT
 <222> (227)..(227)
 <223> Xaa = Ala

<220>
 <221> VARIANT
 <222> (429)..(429)
 <223> P429L

<220>
 <221> VARIANT
 <222> (434)..(434)
 <223> M434V

<400> 194

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
 65 70 75 80

X16700B_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
325 330 335

X16700B_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Leu Trp Pro Glu
420 425 430

Trp Val Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 195
<211> 1722

X16700B_US seq list revised Natl 12May2005.ST25.txt

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 195

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atattttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
ggaacatcat ctttacetgt ttatgatggc aagtttctgg ctcggttgga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttattttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctaatttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaagggac agctttttta gcgtatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat catTTTTTcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680

X16700B_US seq list revised Natl 12May2005.ST25.txt
ttaaactgatt acactagcaa gaaagaaagt tgtgtgggtc tc

1722

<210> 196
<211> 574
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

<220>
<221> VARIANT
<222> (285)..(285)
<223> P285N

<220>
<221> VARIANT
<222> (331)..(331)
<223> V331A

<400> 196

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

x16700B_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys

385 x16700B_US seq list revised Natl 12May2005.ST25.txt 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu
565 570

<210> 197
<211> 642
<212> DNA
<213> Artificial

<220>
<223> synthetic butyrylcholinesterase variant

<220>
<221> misc_feature
<222> (1)..(642)
<223> Anti-CD20 antibody light chain

<400> 197
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x16700B_US seq list revised Natl 12May2005.ST25.txt

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ttcagtggca gtgggtctgg gacagacttc actctcacca tcagcagact ggagcctgaa 240
gatttttgcag tgtattactg tcagcagtgg ctgagtaacc caccactttt tggccagggg 300
accaagctgg agatcaaacg aactgtggct gcaccatctg tcttcatctt cccgccatct 360
gatgagcagt tgaaatctgg aactgcctct gttgtgtgcc tgctgaataa cttctatccc 420
agagaggcca aagtacagtg gaaggtggat aacgccctcc aatcgggtaa ctcccaggag 480
agtgtcacag agcaggacag caaggacagc acctacagcc tcagcagcac cctgacgctg 540
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agctcgcccc tcacaaagag cttcaacagg ggagagtgtt ag 642

<210> 198
<211> 213
<212> PRT
<213> Artificial

<220>
<223> Synthetic butyrylcholinesterase variant

<220>
<221> MISC_FEATURE
<222> (1)..(213)
<223> Anti-CD20 antibody light chain

<400> 198

Glu Ile Val Leu Thr Gln Ser Pro Gly Thr Leu Ser Leu Ser Pro Gly
1 5 10 15

Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Ser Ser Val Pro Tyr Ile
20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
35 40 45

Ala Thr Ser Ala Leu Ala Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro Glu
65 70 75 80

Asp Phe Ala Val Tyr Tyr Cys Gln Gln Trp Leu Ser Asn Pro Pro Thr
85 90 95

Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg Thr Val Ala Ala Pro

Ser	Val	Phe	Ile	Phe	Pro	Pro	Ser	Asp	Glu	Gln	Leu	Lys	Ser	Gly	Thr
	115						120					125			
Ala	Ser	Val	Val	Cys	Leu	Leu	Asn	Asn	Phe	Tyr	Pro	Arg	Glu	Ala	Lys
	130					135					140				
Val	Gln	Trp	Lys	Val	Asp	Asn	Ala	Leu	Gln	Ser	Gly	Asn	Ser	Gln	Glu
145					150					155					160
Ser	Val	Thr	Glu	Gln	Asp	Ser	Lys	Asp	Ser	Thr	Tyr	Ser	Leu	Ser	Ser
				165					170					175	
Thr	Leu	Thr	Leu	Ser	Lys	Ala	Asp	Tyr	Glu	Lys	His	Lys	Val	Tyr	Ala
			180					185					190		
Cys	Glu	Val	Thr	His	Gln	Gly	Leu	Ser	Ser	Pro	Val	Thr	Lys	Ser	Phe
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	210														
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<211>	2298														
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<213>	Artificial														
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<223>	Anti-CD20 antibody VH-CH1 hinge cys L530 BChE.4-1 heavy chain construct														
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cccgggaaag gcctggagtg gatgggggct atttatccct tgacgggtga tacttcctac															180
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ctgcagtgga gcagcctgaa ggcctcggac accgccatgt attactgtgc gagatcgact															300
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gaagggacag	cttttttagc	gtatggtgct	cctggcttca	gcaaagataa	caatagtatc	1740
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acagagtcaa	caagaataat	gacgaaacta	cgtgctcaac	aatgtcgatt	ctggacatca	2280
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<210> 200

<211> 765

<212> PRT

<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

<220>

<221> MISC_FEATURE

<222> (1)..(765)

<223> Anti-CD20 antibody VH-CH1 hinge cys L530 BChE.4-1 heavy chain construct

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Ser Leu Lys Ile Ser Cys Lys Gly Ser Gly Arg Thr Phe Thr Ser Tyr
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Asn Met His Trp Val Arg Gln Met Pro Gly Lys Gly Leu Glu Trp Met
35 40 45

Gly Ala Ile Tyr Pro Leu Thr Gly Asp Thr Ser Tyr Asn Gln Lys Ser
50 55 60

Lys Leu Gln Val Thr Ile Ser Ala Asp Lys Ser Ile Ser Thr Ala Tyr
65 70 75 80

Leu Gln Trp Ser Ser Leu Lys Ala Ser Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Ser Thr Tyr Val Gly Gly Asp Trp Gln Phe Asp Val Trp Gly
100 105 110

Lys Gly Thr Thr Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser
115 120 125

Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala
130 135 140

Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val
145 150 155 160

Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala
165 170 175

Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val
180 185 190

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Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His
195 200 205

Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Ala Glu Pro Lys Ser Cys
210 215 220

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Lys Leu Glu Asp Asp Ile
225 230 235 240

Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met Asn Leu Thr Val
245 250 255

Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro Tyr Ala Gln Pro
260 265 270

Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser Leu Thr Lys Trp
275 280 285

Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln Asn
290 295 300

Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu Met Trp Asn Pro
305 310 315 320

Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ile Pro
325 330 335

Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp Ile Tyr Gly Gly
340 345 350

Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr Asp Gly Lys Phe
355 360 365

Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met Asn Tyr Arg Val
370 375 380

Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro Glu Ala Pro Gly
385 390 395 400

Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln Trp Val Gln Lys
405 410 415

Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val Thr Leu Phe Gly
420 425 430

Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu Leu Ser Pro Gly

Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser Gly Ser Ala Asn
450 455 460

Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg Asn Arg Thr Leu
465 470 475 480

Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn Glu Thr Glu Ile
485 490 495

Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile Leu Leu Asn Glu
500 505 510

Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val Asn Phe Gly Pro
515 520 525

Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp Ile Leu Leu Glu
530 535 540

Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly Val Asn Lys Asp
545 550 555 560

Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly Phe Ser Lys Asp
565 570 575

Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu Gly Leu Lys Ile
580 585 590

Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser Ile Leu Phe His
595 600 605

Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn Tyr Arg Glu Ala
610 615 620

Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys Pro Ala Leu Glu
625 630 635 640

Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala Phe Phe Tyr Tyr
645 650 655

Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu Trp Met Gly Val
660 665 670

Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu Pro Leu Glu Arg
675 680 685

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Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser Arg Ser Ile Val
690 695 700

Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro Asn Glu Thr Gln
705 710 715 720

Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr Glu Gln Lys Tyr
725 730 735

Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr Lys Leu Arg Ala
740 745 750

Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys Val
755 760 765

<210> 201
<211> 530
<212> PRT
<213> Artificial

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<223> synthetic butyrylcholinesterase variant

<220>
<221> MISC_FEATURE
<222> (1)..(530)
<223> L530 construct

<400> 201

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp
100 105 110

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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
355 360 365

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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
515 520 525

Val Leu
530